Smooth by design

Boat's innovative 'M-hull' is meant to let military vessel plane over rough waters

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The 80-foot vessel under construction at the Knight & Carver boatyard in National City has required no nails, no rivets and no welding.

When it is completed, the craft will be one of the largest ever made completely from carbon composites, the featherweight stuff used to make tennis rackets, golf shafts and skis.

SEAN MASTERSON
Julio Osuna trimmed an edge of a carbon composite panel on the deck of the Stiletto, under construction at Knight & Carver boatyard.

In contrast to the dazzling luxury yachts at the 34-year-old marine repair center, the angular black boat looks stealthy, purposeful and ominous. It will be named the Stiletto.

If construction is completed in December as expected, the Stiletto will be painted in camouflage and turned over to the Pentagon's Special Operations Command for use by Navy SEALs and other special forces.

The boat was ordered by Defense Secretary Donald Rumsfeld's Office of Force Transformation. The $6 million contract was intended to assess the use of new carbon composite materials in warships as well as the innovative hull design, which was conceived by M Ship Co., a San Diego maritime design firm.

The hallmark of the firm's "M-hull" design lies mostly below the waterline.

SEAN MASTERSON

The underside of the hull features four tunnels that channel the bow wave in a way that generates lift beneath the boat. Air churned from the bow wave is forced under increasing pressure through the tunnels, creating an air cushion against the hull that acts like that on an air hockey table.

An interior view of the boat reveals the tunnels that channel the bow wave in a way that generates lift beneath the boat.

The reduced drag allows the ship to plane and attain high speeds and greater stability – at least theoretically.

"We don't have computer-generated models that can test these concepts, so we have to build," said Navy Cmdr. Gregory E. Glaros, who has been overseeing construction for the Pentagon. "Part of our objective is to use this 80-foot model and generate the data we can use to build computer models so the government can explore new hull forms without the expense of actually building them."

Powered by four 1,650-horsepower marine diesel engines, the Stiletto is expected to cruise at up to 50 knots, equivalent to land speed of 58 miles per hour. Some small Navy boats can go that fast now. But the buffeting effects of bouncing across the waves can be so severe that sailors and other servicemen are routinely injured by the jolts.

The M-hull design promises a far smoother ride. That promise has drawn interest at the U.S. Coast Guard, as well, since it often makes high-speed interdictions of drug runners in coastal waters.

The design, named for the hull's M-shaped cross-section, represents a new technology that M Ship Co.'s founders, Chuck Robinson and Bill Burns, developed at the request of the water transit authority in Venice, Italy.

"They came to us for a solution to the problem of wave damage along the canals," Burns said. Destructive boat wakes were causing erosion and other serious problems for the foundations of ancient buildings in the city of canals.

The maritime engineers originally developed the M-hull to reduce boat wakes. The designers built a 23-foot water taxi. That led the Venice water authority to order a 65-foot ferry, the Vaporetto Mangia Onda, or "wave eater," which was built by Knight & Carver.

Robinson and Burns saw that the M-hull design also offered the potential for higher speeds with improved stability and fuel efficiency. Robinson, an erstwhile engineering instructor at the U.S. Naval Academy and a former official in President Ford's administration brought the idea to acquaintances in government.

Glaros said he reviewed the design, along with others, at a time when new mission requirements for coastal operations were leading planners to push for shallow-draft boats that offered improved performance and lower costs.

"What intrigued us about this was the simplicity of the design," Glaros recalled. Navy officials were particularly encouraged by tests of a 38-foot aluminum boat with an M-

hull. While headed into the wind, the prototype actually increased its speed by 15 percent without adjusting the throttle, Glaros said.

Similar thinking drove the Navy's development of the X-Craft by San Diego's Titan Corp., which is now part of L-3 Communications. Christened the Sea Fighter, the experimental coastal warship is now based in San Diego.

"We weren't really pushing any science on the X-craft, either in terms of the materials or the hull form," Glaros said.

The contract for the Stiletto also provided an opportunity to push the development of an information systems backbone that Glaros called "an electronic keel." The concept calls for installing a high-capacity computer network in the vessel that allows the Navy to simply plug in new weapons systems, sensors and computers as such technologies advance.

Construction of the Stiletto began in November at Knight & Carver, with roughly 40 workers on the project. The privately held boatyard, which specializes in refitting and repairing super yachts, has about 180 people on the payroll, said Tim Kelly, Knight & Carver's general manager.

Among other things, Glaros said, the venture represents a test of carbon composite construction techniques.

"Can we take a design and lay the fiber accurately enough to make sure there are no gaps or weaknesses," he said.

With guidance from SP Systems, a British subcontractor that makes composite materials, the team developed techniques for making foam-core panels. The pieces are bonded together using epoxy and carbon fiber strips.

Refining such manufacturing techniques is also part of a broader effort to reinvigorate the nation's moribund shipbuilding industry, Glaros said.

As commercial ship construction shifted to Asia and elsewhere, the United States' shipyards have focused almost exclusively on military construction.

"We can now explore these things and fulfill the needs of the market," Glaros said, "not only militarily but commercially as well."

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